



# **Balance System Challenge Mode Test Results**

April 18, 2006

# OVERVIEW

- Balance System Challenge Mode Protocol
- Challenge Sites Selected
- Prototype Phase II EVR Hanging Hardware Installed
- Test Results
- Fugitive Emissions
- Conclusion

# Balance Challenge Protocol

- Objective: Determine if balance systems without a processor will meet EVR pressure profile performance standards
- Protocol posted on ARB vapor recovery web page November, 2005

# Balance Challenge Protocol

## Requirements:

- ✓ 9 hour shut down
- ✓ Winter fuel (uncontrolled RVP)
- ✓ Warmer climate than Sacramento
- ✓ Minimum 30 day test period
- ✓ Monitor UST pressure, RVP, and conduct vapor recovery testing

# Balance Challenge Protocol

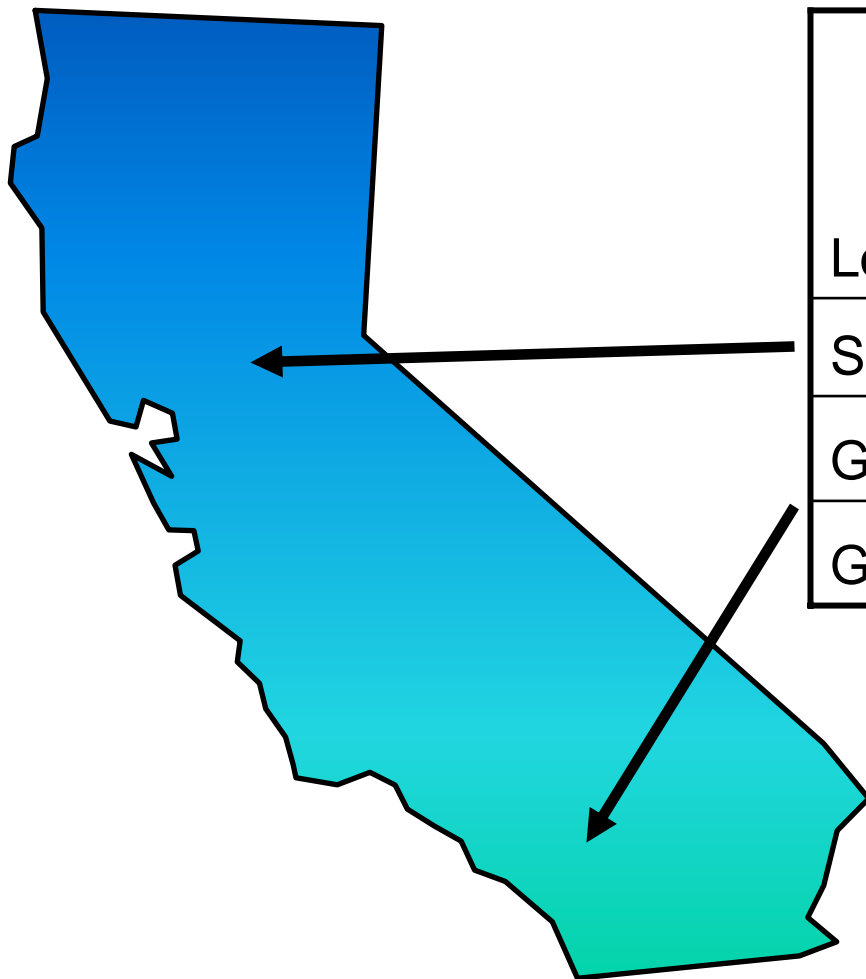
Test Procedure	Description	Frequency
TP-201.1E	PV Valve	Day 1, Day 30
TP-201.2B	Nozzle Vapor Valve	Day 1
TP-201.3	Leak Decay	Day 1, Mid-Point, Day 30
TP-201.4	Back Pressure	Day 1, Day 30
TP-201.6C	Liquid Removal	Day 1, Mid-Point, Day 30
TP-201.7	15 point Data-logger Accuracy Check	Day 1, Day 30
TP-201.7	Download Data	Twice per Week
ASTM D5191	RVP Analysis	Weekly

Note: Drop Tube and Adaptor Torque testing also conducted at day 1 and day 30 as required by SCAQMD permit to operate

# Challenge Sites Selected

GDF #1	GDF #2
Inland Empire Region Southern California	Inland Empire Region Southern California
Wayne Vista Series Unihose Balance Dispensers	Wayne Vista Series Unihose Balance Dispensers
Phil-Tite Phase I EVR System	Phil-Tite Phase I EVR System
Hours of Operation: 6:00 am – 9:00 pm (Mon-Sat) 9:00 am – 7:00 pm (Sun)	Hours of Operation: 6:00 am – 9:00 pm (Mon-Sat) 9:00 am – 7:00 pm (Sun)
Year Built: 2003	Year Built: 2002
Throughput: 400k +	Throughput: 400k +
12 fueling points	12 fueling points

# Challenge Sites Selected



Location	Average Maximum Temp (F) November	Average Minimum Temp (F) November
Sacramento	63.5	42.7
GDF # 1	74.4	43.4
GDF # 2	73.1	45.1

Source: Western Regional Climate Center wrcc@dri.edu

# Phase II EVR Equipment Installed

	Manufacturer #1	Manufacturer #2	Manufacturer #3
Location	GDF # 1	GDF # 2	GDF # 1
Nozzle Vapor Valve	Internal - lever actuated	Internal - lever actuated	Bellows actuated
Curb Hose	8 foot	8 foot	8 foot
Breakaway	Re-connect	Non re-connect	Re-connect
Whip	4 foot w/ retractor	4 foot w/ retractor	4 foot w/ retractor



# Manufacturer #1 Test Results

## (11/09/05 -12/13/05)

Test Procedure	Description	Day 1	Mid Point	Day 30
TP-201.1B	Adaptor Torque	PASS	N.A.	PASS
TP-201.1C	Drop Tube	PASS	N.A.	PASS
TP-201.1E	PV Valve	PASS	N.A.	*FAIL
TP-201.2B	Nozzle Vapor Valve	PASS	N.A.	N.A.
TP-201.3	Leak Decay	PASS	PASS	PASS
TP-201.4	Back Pressure	PASS	N.A.	PASS
TP-201.6C	Liquid Removal	PASS	PASS	PASS

\* Positive leak rate failure of PV valve (0.42 cfh @ 1.41" H<sub>2</sub>O). No ball valve installed.  
 Replaced PV valve and continued pressure monitoring for additional two weeks.  
 No significant change in pressure profile.

# Manufacturer #2 Test Results

(11/11/05 -12/16/05)

Test Procedure	Description	Day 1	Mid Point	Day 30
TP-201.1B	Adaptor Torque	PASS	N.A.	PASS
TP-201.1C	Drop Tube	PASS	N.A.	PASS
TP-201.1E	PV Valve	PASS	*FAIL	PASS
TP-201.2B	Nozzle Vapor Valve	PASS	N.A.	N.A.
TP-201.3	Leak Decay	PASS	PASS	PASS
TP-201.4	Back Pressure	PASS	N.A.	PASS
TP-201.6C	Liquid Removal	PASS	PASS	PASS

\*Cracking pressure failure of PV Valve (+10.56). No ball valve installed.  
Replaced PV valve on 11/22/05 and continued testing.

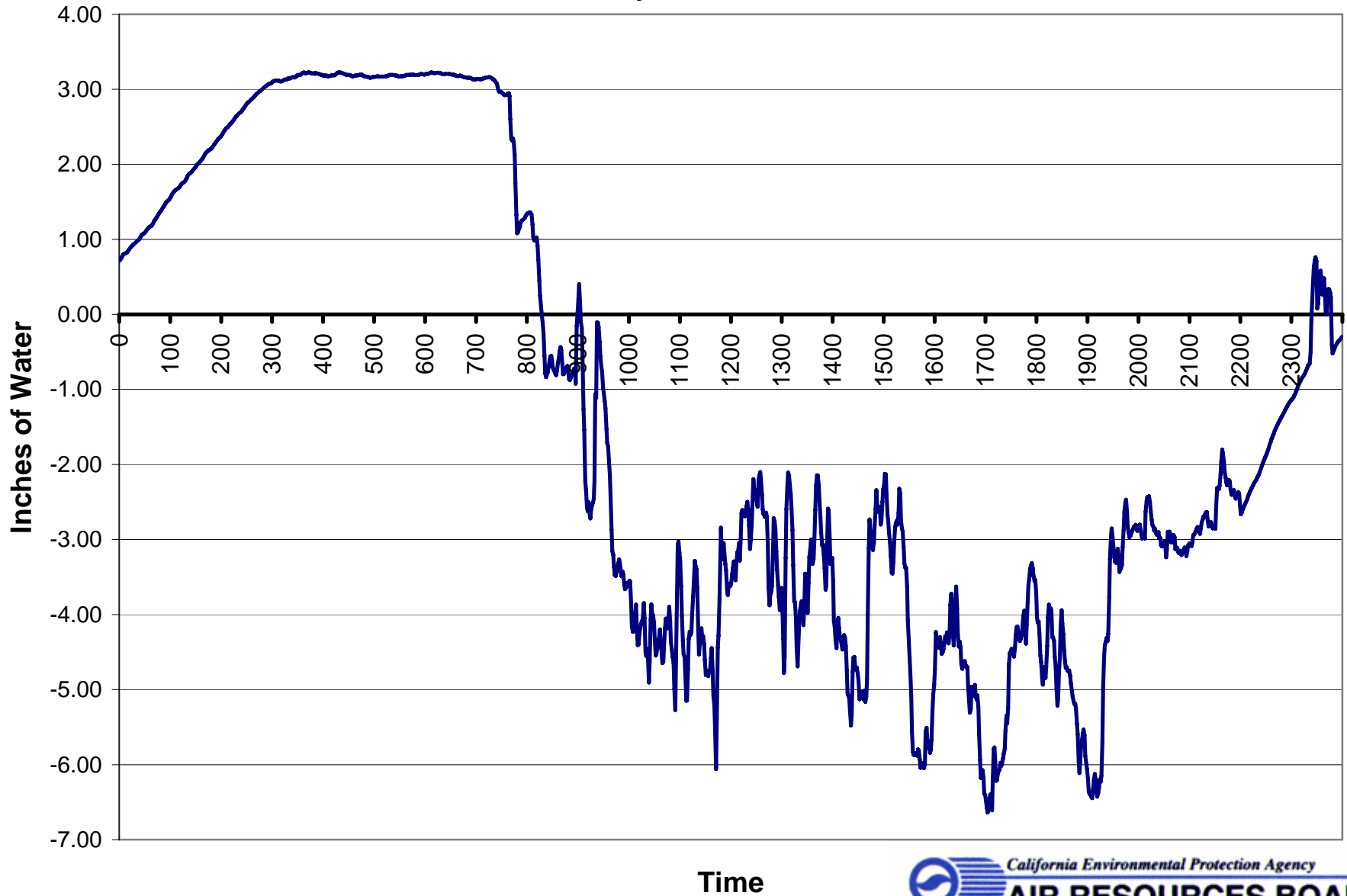
# Manufacturer #3 Test Results

(12/30/05-2/20/06)

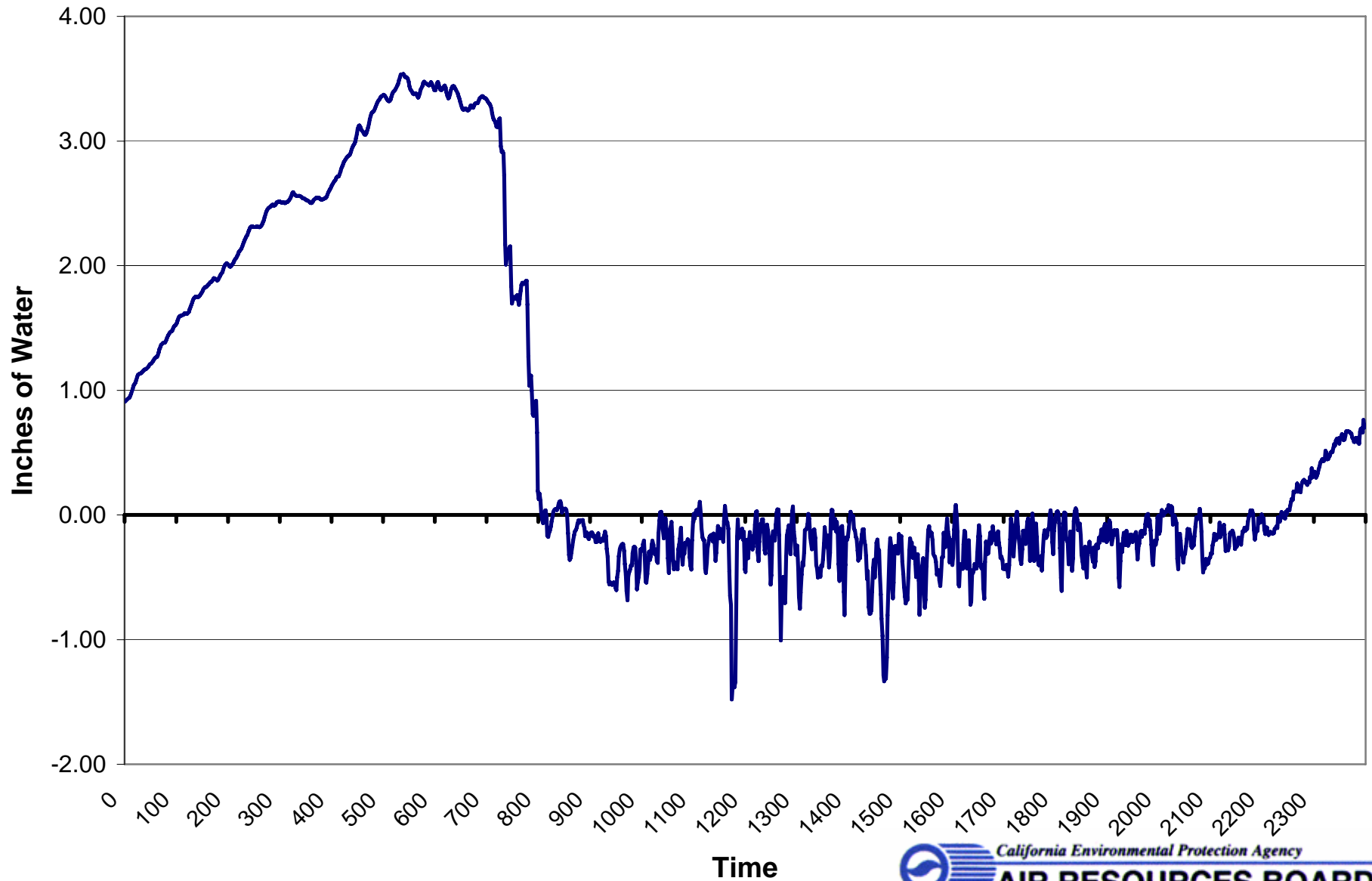
Test Procedure	Description	Day 1	Mid-point	Day 58
TP-201.1B	Adaptor Torque	PASS	N.A.	PASS
TP-201.1C	Drop Tube	PASS	N.A.	PASS
TP-201.1E	PV Valve	PASS	FAIL <sub>(1)</sub>	PASS
TP-201.2B	Nozzle Vapor Valve	PASS	N.A.	FAIL <sub>(3)</sub>
TP-201.3	Leak Decay	PASS	FAIL <sub>(2)</sub>	FAIL <sub>(4)</sub>
TP-201.4	Back Pressure	PASS	N.A.	PASS
TP-201.6C	Liquid Removal	PASS	PASS	PASS

- 1) Positive leak rate failure, replaced with new PV valve and resumed testing. No ball valve installed.
- 2) Nozzle vapor valve failure on two nozzles detected by bagging, nozzles replaced and test resumed.
- 3) Three nozzles failed vapor valve leak rate testing, one gross failure.
- 4) Due to nozzle leak rate failure.

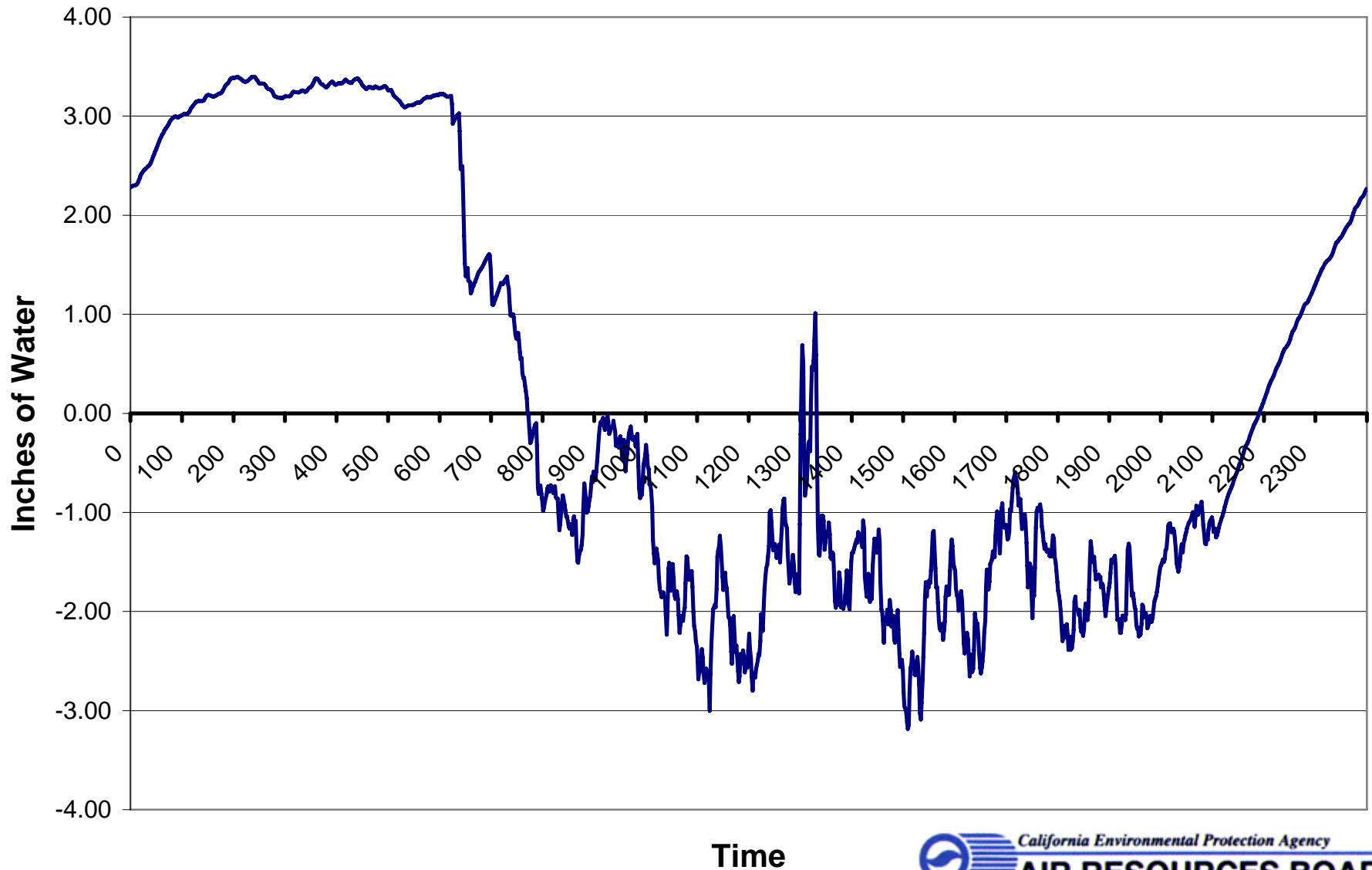
**Balance System Challenge Mode  
Manufacturer #1 EVR Equipment Installed  
Typical Daily UST Pressure Profile  
Saturday, November 12, 2005**



**Balance System Challenge Mode  
Manufacturer #2 EVR Equipment Installed  
Typical Daily UST Pressure Profile  
Saturday, November 26, 2005**



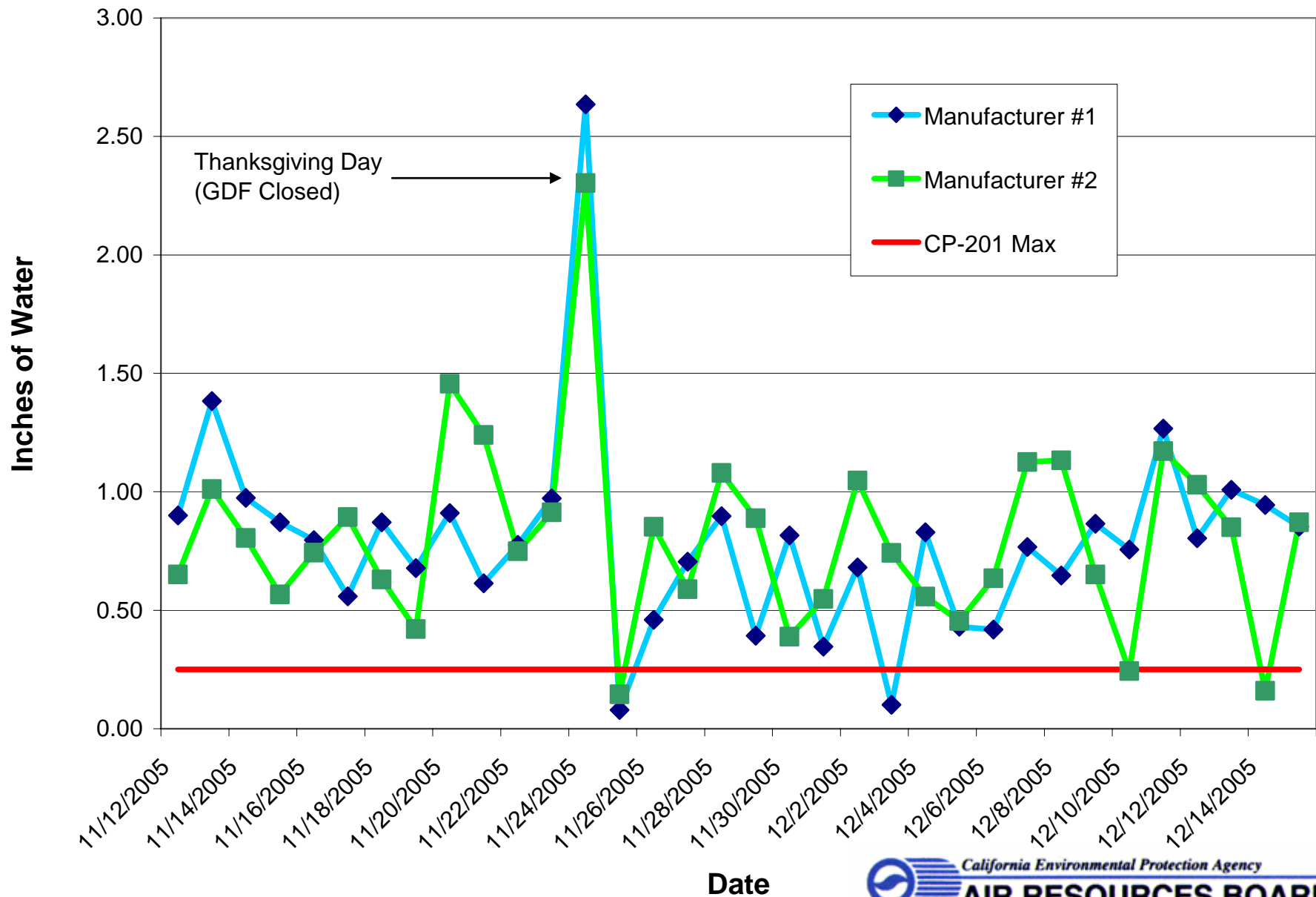
**Balance System Challenge Mode  
Manufacturer #3 EVR Equipment Installed  
Typical Daily UST Pressure Profile  
Saturday, January 7, 2006**



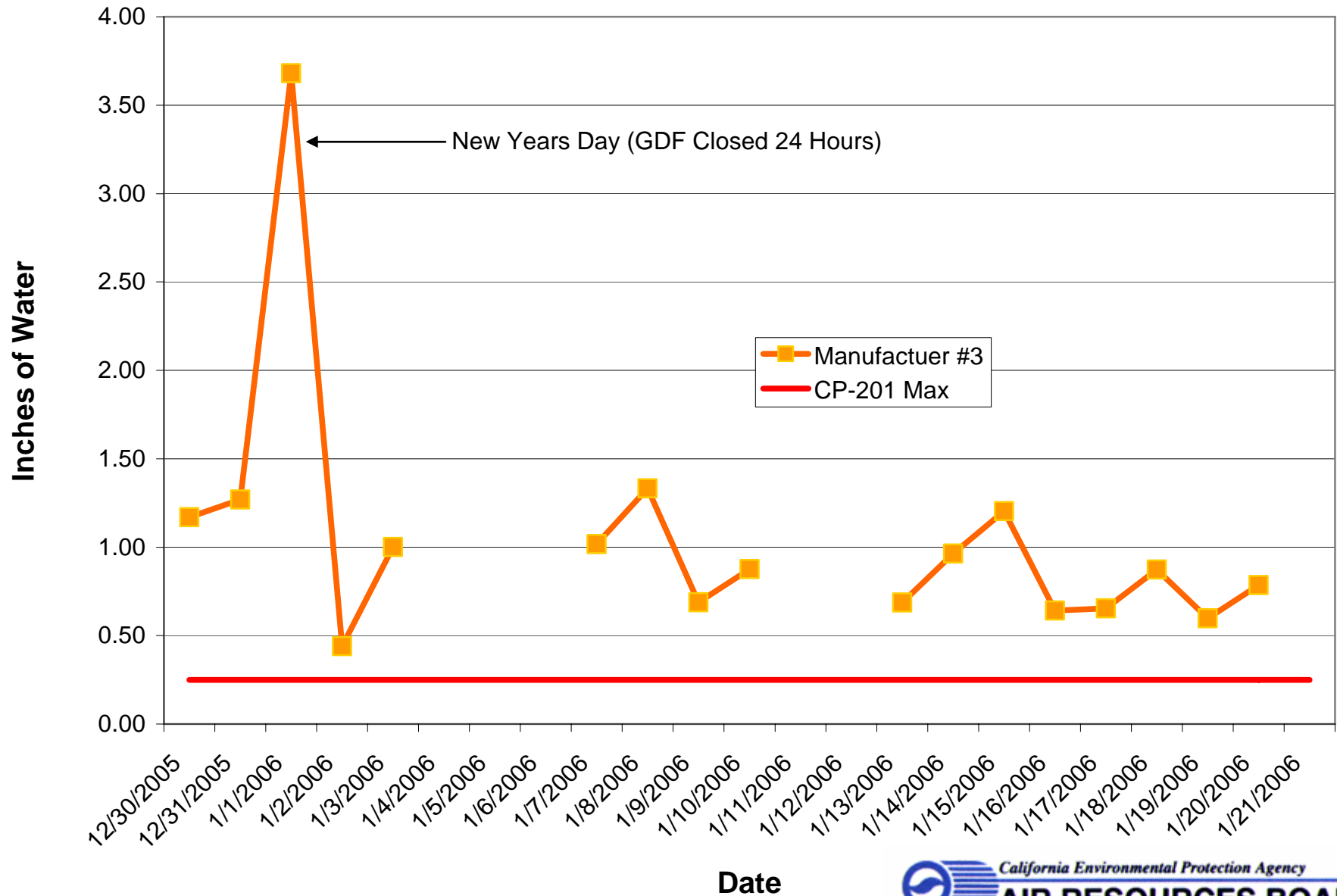
# Balance System Challenge Mode Test Results

## ARB Daily Average UST Pressure Data

### Manufacturer #1 and #2 EVR Systems



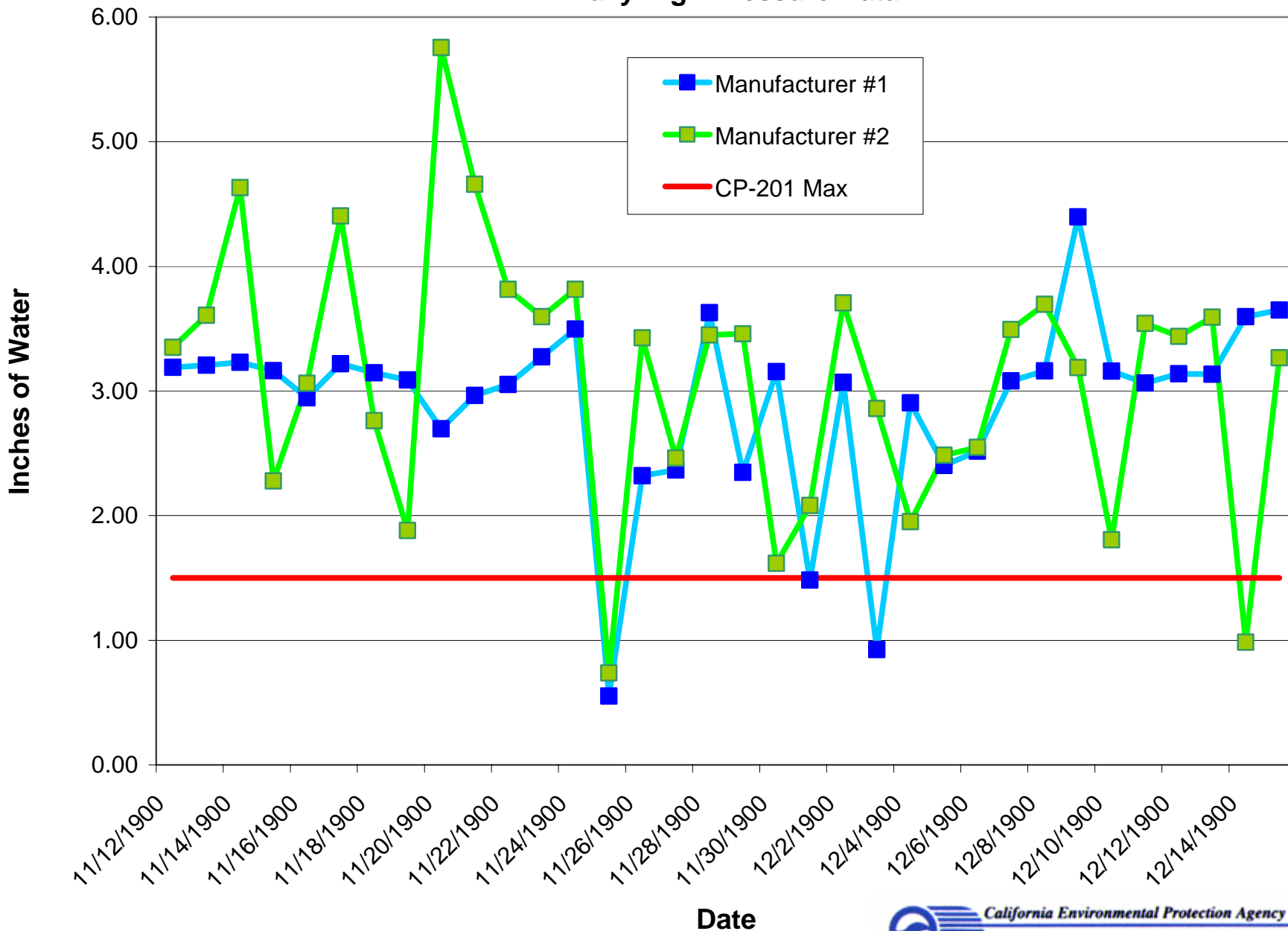
**Balance System Challenge Mode Test Results**  
**ARB Daily Average UST Pressure Data**  
**Manufacturer #3 EVR System**





# Balance System Challenge Mode Test Results

## ARB Daily High Pressure Data



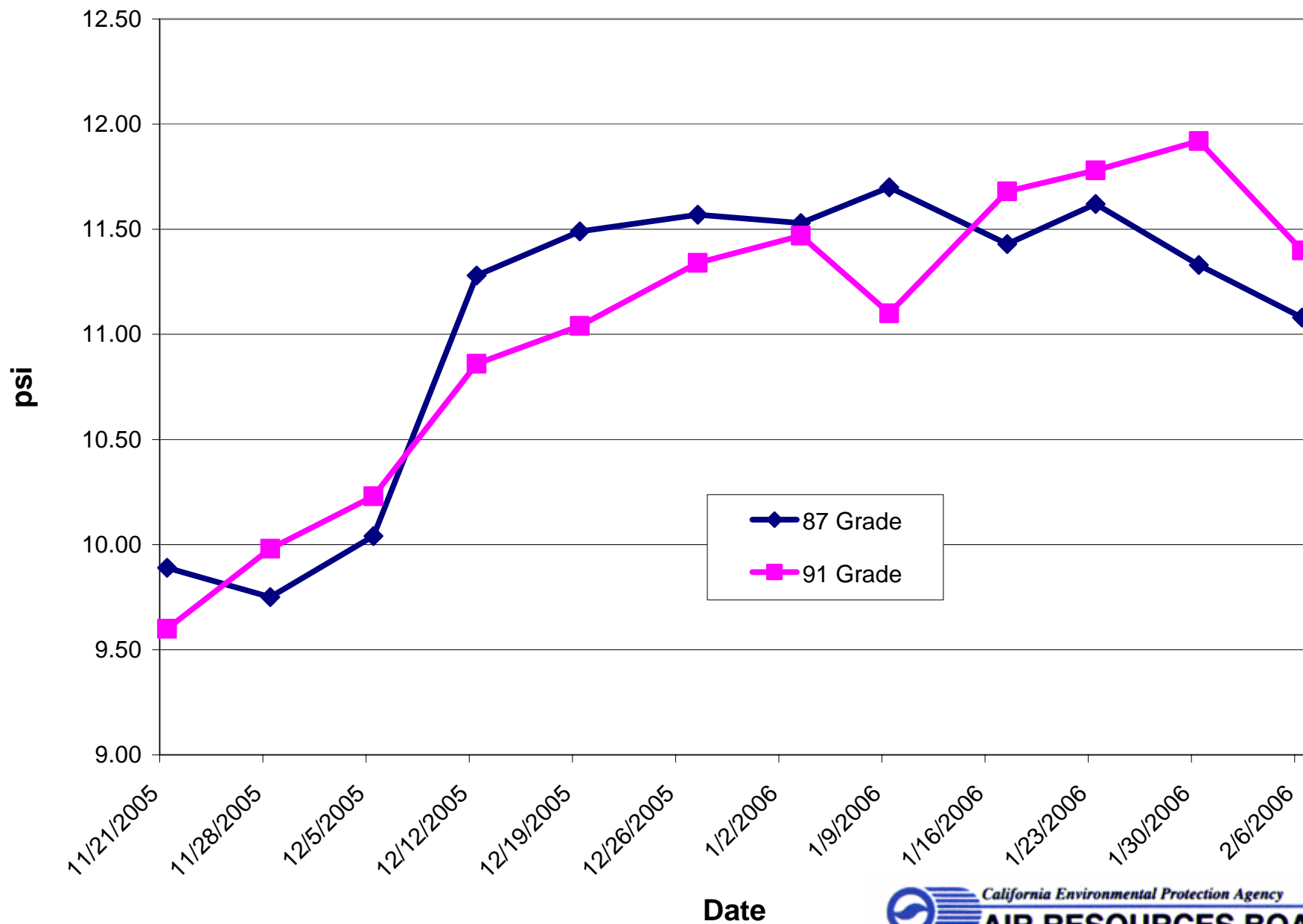
# Test Results

(Based on a 30-Day Rolling Average)

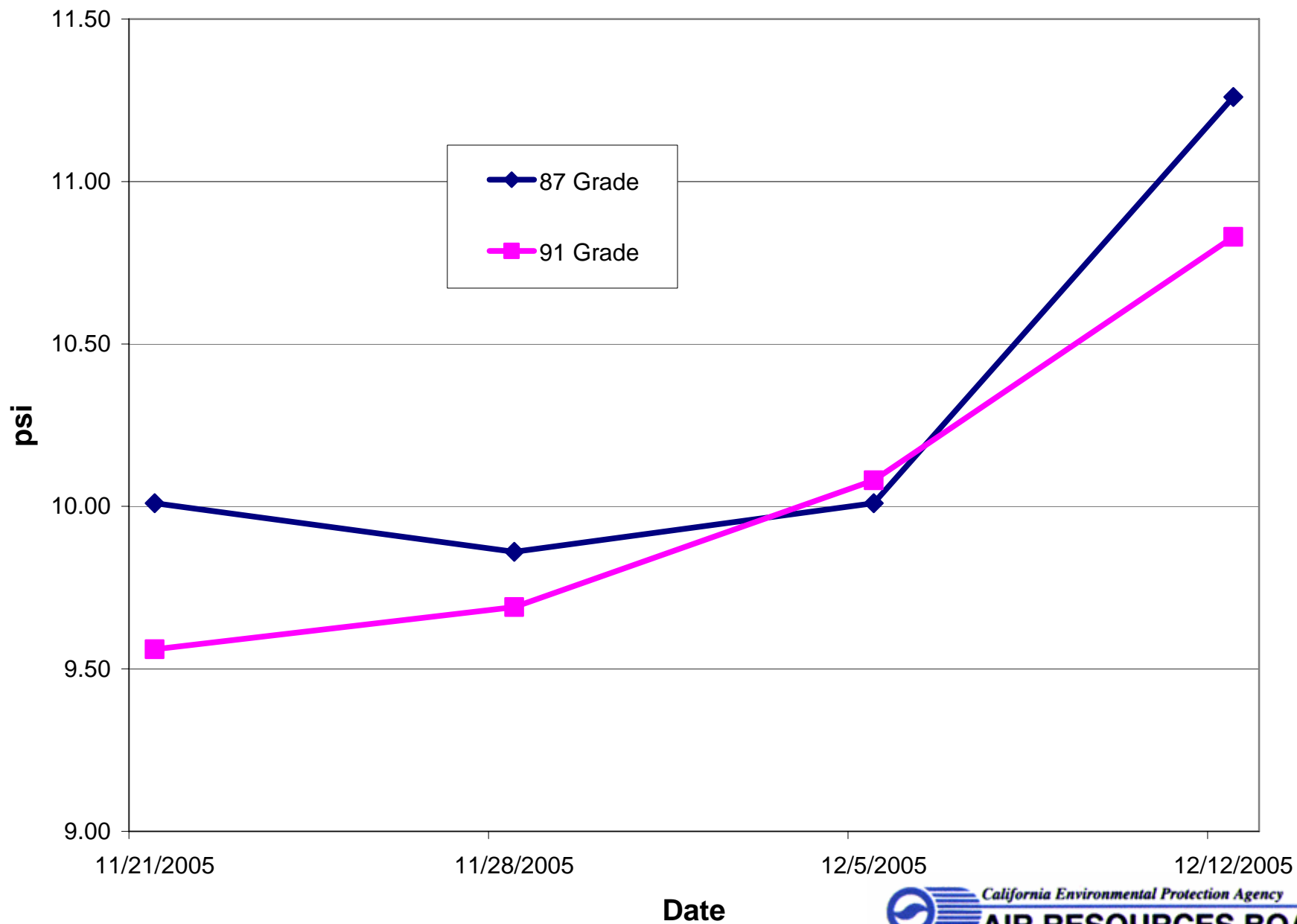
Manufacturer	Daily Average Pressure	Daily High Pressure
#1	0.78"H2O	2.84"H2O
#2	0.82"H2O	3.14"H2O
#3	1.05"H2O*	TBD
CP-201	0.25"H2O	1.50"H2O

\*Based on 17 day rolling average, pressure data not bracketed by successful test results.

## GDF#1 RVP Analysis Summary



## GDF#2 RVP Analysis Summary



# Fugitive Emission Factor

Manufacturer #1 EVR Balance System		CP-201 Requirement (lbs/1,000 gallons)
Without Processor (lbs/1,000 gallons)	With Processor* (lbs/1,000 gallons)	
0.43	0.08	0.19

Note: based on 150,000 gallons/month throughput

\*Assumes controlled at 0.25" H2O

# Fugitive Emissions

Description	Manufacturer #1 EVR Balance System	
	Without Processor	With Processor
Number of balance sites in California	5,000	5,000
Emission Factor (lbs/1,000 gallons)	0.43	0.08
Throughput (Gallons/Month)	150,000	150,000
Fugitive Emissions (Tons/Year)	1,935	360

# Conclusion

- Pressure management system will be needed for EVR balance systems
- Draft report in May, 2006
- Final report in July, 2006